The CRUSHED STONE JOURNAL

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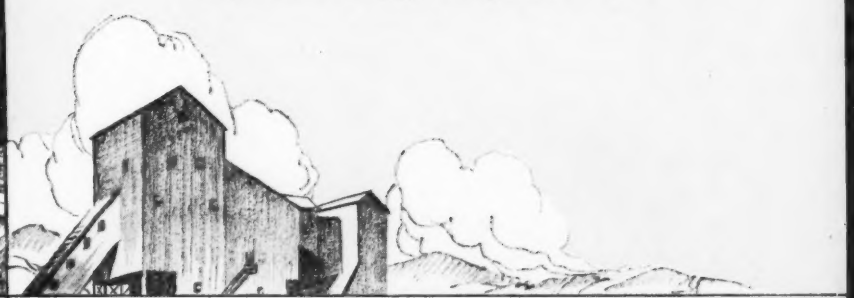
- Free Enterprise vs. Feudalism
- The Viewpoint of an Employer Toward Industrial Hygiene
- The Impact of War on Construction
- Causes of Highway Balances



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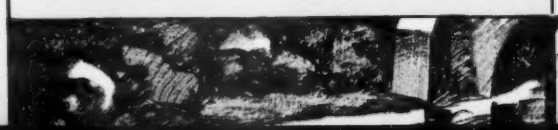

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The Crushed Stone Journal

Official Publication of the NATIONAL CRUSHED STONE ASSOCIATION

J. R. BOYD, Editor

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1735 14th St., N. W.
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HOTEL JEFFERSON
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CONVENTION HOTEL OF 23RD ANNUAL MEETING

THE
CRUSHED STONE JOURNAL
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Vol. XIV No. 6 NOVEMBER-DECEMBER, 1939

St. Louis Convention Program Takes Final Shape

PLANS are rapidly nearing completion for making the 23rd Annual Convention of the National Crushed Stone Association, which will be held at the Jefferson Hotel, St. Louis, Missouri, on January 22, 23, and 24, 1940, a meeting inspiring in character and of vital significance to crushed stone producers. Today, more than ever before, it seems essential that business men act in concert and on the basis of intelligent and farsighted thinking. The Annual Convention of the National Crushed Stone Association affords to those engaged in the business of producing crushed stone the only opportunity throughout the year of assembling together for the mutual consideration of problems outstandingly important to the continued welfare and prosperity of the crushed stone industry. Such an opportunity carries with it a very definite and real responsibility—the responsibility of leaving our desks, our individual jobs, for the brief time required to attend this highly important gathering.

It is earnestly believed that the program for the St. Louis Convention will prove to be one of the best and most interesting in the history of our organization. Well balanced in its recognition of problems peculiar to crushed stone producers and in its consideration of topics of concern to all industry, it should receive enthusiastic approval.

The following briefly outlines some of the more important highlights of the meeting. The final program in complete detail will be sent out immediately after the first of the year.

The opening session of the Convention on Monday morning, January 22, will be devoted to hearing reports from the various regional vice presidents on business conditions in 1939 and the outlook for 1940. With leading economists in the country evidencing some disagreement as to the trend the business cycle will take during 1940, these summaries should prove of great interest. Reports will also be received from the Engineering Director and the Administrative Director concerning Association activities during the past year.

A question foremost in the minds of all is, "To what extent will the European conflict affect American business?" To throw some light on this intensely interesting and practical problem, Dr. David Friday will address the Convention on the subject "War and the Business Outlook." Dr. Friday is internationally known in the field of economics. Numbered among his important accomplishments is a lecture course which he has been giving annually for the past few years before the Army War College in Washington.

For the luncheon address on Monday, we have obtained a man who has been phenomenally successful in the field of sales psychology—Elmer Wheeler, President of the Tested Selling Institute and lecturer at the Dale Carnegie Institute. His talk—"Magic Words That Make People Buy"—should long be remembered for its wit, humor and good common sense.

A number of important topics will engage the attention of the Convention on Monday afternoon. As was explained to us at our St. Louis Convention in 1936, the Public Roads Administration (formerly the Bureau of Public Roads) was just starting at that time, in cooperation with the several states, a detailed, comprehensive study of the highway needs of the country. Since then these studies have been largely completed and form the basis of a report by the Public Roads Administration to Congress the early part of this year. This report is certain to serve as a guide to the states and to the Federal Government in the development of highway programs for the future. No emphasis on our part should be

needed to point out its importance to the crushed stone industry. Mr. H. S. Fairbank, Chief of the Division of Information of the Public Roads Administration, will discuss this subject under the title, "Long Range Planning for Highway Construction."

Highway programs during recent years have been drastically curtailed as a result of the diversion of gas tax revenues and this problem continues to be public enemy no. 1 to a resumption of normal highway construction. With some reasonable expectation that the relief problem will become less acute as the economic situation improves, it would seem possible to bring about the return of gas tax revenues to the purposes for which they were originally intended. However, a new candidate for gas tax monies looms on the horizon as vast sums will unquestionably be needed to finance the constantly expanding program of social security and old age pensions. Therefore, energetic and forceful measures will be needed to prevent continued and possibly further gas tax diversion. An outstanding authority on this subject is Major Roy F. Britton, President of the Automobile Club of Missouri, and formerly Director of the National Highway Users Conference. Major Britton has consented to talk to us on the subject, "Meeting the Problem of Gas Tax Diversion," and his talk coupled with the open forum discussion scheduled to follow should prove a most valuable contribution to the Convention program.

Gratifying as it has been during recent months to observe that the railroads are again making substantial capital expenditures for equipment and maintenance of way, specific information concerning railroad plans for the coming year has not as yet materialized. Arrangements have about been concluded to have a prominent railroad official outline for us the "Ballasting Requirements of the Railroads for 1940." Such a discussion is certain to command the interest of all producers.

Much uncertainty also exisits with regard to plans of the Federal Government in the field of public works and we expect to have a representative of the Federal Works Agency enlighten us along these lines.

At 6:30 P. M. on Monday evening there will be an informal reception for all in attendance at the Convention. This will be followed immediately by a buffet supper. At 8:00 P. M. formal opening of the Manufacturers' Division Exposition will take place. This feature of the Annual Convention is too well known to the industry to require any detailed elaboration in this brief review. The success of this Exposition is now assured as to date the area of space subscribed is equal to that of last year and seems definitely certain to exceed that figure between now and the time of the Convention. While speaking of the Exposition it should be pointed out that in accordance with the custom of the last two years, Tuesday afternoon has been set aside exclusively for an inspection of the various exhibits. Manufacturers of machinery and equipment utilized in the production of crushed stone will have on display their latest developments and improvements. Technical men will be available for consultation and, as before, the Exposition is certain to prove one of the most valuable and helpful features of the Annual Meeting.

To make the Convention program more attractive and valuable to superintendents and operating men, arrangements have been made to have a number of operating problems discussed Tuesday morning. The outstanding success of the truck-trailer system of quarry haulage, recently inaugurated by the New York Trap Rock Corporation, has commanded widespread interest throughout the industry. This system will be discussed in detail by Mr. Stirling Tomkins, President of the New York Trap Rock Corporation, and supplemented by moving pictures of the equipment in actual operation. Undoubtedly many questions will grow out of Mr. Tomkins' discussion and a generous allowance of time is being provided for a full development of the topic.

With the truck playing such an important part in quarry operations today, the subject, "Pneumatic Tires—Their Use and Care in Quarry Service," should prove of absorbing interest and practical value. A talk on this will be given by a well known expert in this field.

During the past year events have transpired which give emphasis to the need of bringing about certain improvements in the production of crushed stone and arrangements are being made for a comprehensive treatment of this important problem. Both executives and plant men will learn much to their profit by hearing this discussion.

The Annual Banquet which will be held on Tuesday evening immediately following a reception in Presidential headquarters, will be a highly colorful, entertaining and inspirational affair. Entertainment exceptional in character will be presented during the serving of the dinner. Following this, two features have been scheduled: First, there will be a presentation by Dr. John W. Finch, Director of the U. S. Bureau of Mines, of the Safety Trophy and the Cer-

tificates of Award to those companies attaining distinction in the National Crushed Stone Association Safety Contest. By scheduling this presentation on the program of the Annual Banquet, it is felt that more appropriate recognition is accorded to members of the Association who have made distinctive records in the field of accident prevention. Second, the principal Banquet address will be made by Dr. Allen A. Stockdale. Dr. Stockdale enjoys an exceptionally fine reputation as an after dinner speaker, and has been widely acclaimed during recent years for his inspiring and intellectual addresses to business groups.

Wednesday, the final day of the Convention period, will be no anti-climax for both during the morning and afternoon sessions the topics to be discussed are certain to hold every producer in the meeting room until the last word has been spoken. Recognizing that a substantial part of the crushed stone industry is particularly interested in the production and marketing of agricultural limestone, two presentations on this subject have been scheduled. The growing importance concerning the use of agricultural limestone will be broadly discussed by Dr. E. E. DeTurk, Professor of Soil Fertility at the University of Illinois. Dr. DeTurk has for many years been recognized as an outstanding authority in this field and we are privileged to have him appear on the Convention program. Following his discussion there will be shown motion pictures in color, depicting the production of agricultural limestone from both open-face quarries and underground mines.

The rapidly expanding defense program of the country is centering attention upon the need for increasing our airport facilities and a move is definitely under way to finance such an undertaking through Federal participation substantially along the lines of the Federal Aid Highway Program. The interest of the crushed stone industry in extensive airport construction activities is obvious and we are fortunate indeed to have Major A. B. McMullen, Chief, Airport Section of the Civil Aeronautics Authority, address us on the subject, "Expanding Our Airport Facilities."

Much is heard these days concerning price control by Government and it is no secret that an important section of governmental thought is centering its attack not only on the basing point system as a whole, but goes even further in advocating that selling on a delivered price basis should be prohibited. We cannot know too much concerning current developments in this field. This phase of governmental activity has long been the subject of intensive study by Edwin B. George, Associate Editor of Dun's Review, a publication put out by Dun and Bradstreet of New York. Mr. George will discuss for us, "Price Control by Government." This should prove timely and highly illuminating.

Employer-employee relationships continue to take front rank as a subject about which business men should be fully informed, and before attempting to solve such problems an important prerequisite would seem to be to get the worker's point of view. How to do this will be discussed by one who has given the subject his intensive study during recent years. His suggestions will be practical in nature and based upon the results of many illuminating experiences. Not long ago the National Association of Manufacturers made a nation-wide survey of employee attitude, the results of which have been reduced to a sound slide film which it is expected will be shown at the conclusion of this talk.

The nature of the concluding session on Wednesday afternoon guarantees a maximum attendance for the last business session of the Convention. It will open with a report for the Executive Committee on our application for seasonal exemption under the Fair Labor Standards Act of 1938, presented by Mr. Graves. During the past year the Association has intensively applied itself to the task of obtaining seasonal exemption for the industry and the results of this effort as reported by Mr. Graves should command the interest of all.

Machinery has been set in motion, as you will recall, for making a determination of prevailing minimum wages for the crushed stone industry under the Walsh-Healey Act. Just what is to be accomplished, how it is to be done, and the possible results flowing from such a determination, are considerations which touch every member of the industry whether or not he is directly subject to the provisions of the Walsh-Healy Act. Obviously, no one is better able to inform us concerning these matters than the man charged with the responsibility of carrying into effect the provisions of the Act and we are happy to announce that L. Metcalf Walling, Administrator, Government Contracts Division, U. S. Department of Labor, will speak to us on this vitally important subject.

The discussion period following Mr. Walling's talk will provide exceptional opportunity to clarify any

misunderstandings and perplexities concerning the administration of the Act.

Governmental policies as they relate to business and particularly in the field of labor relations, continue to be of paramount importance and we know the industry will enthusiastically endorse our good judgment in obtaining as the speaker on this topic, John Gall, General Counsel of the National Association of Manufacturers. As Mr. Gall has been with us on previous occasions he needs no introduction to those who have had the privilege of hearing him in the past. To those who have not, we can only say, by all means plan to hear him at the St. Louis Convention. Following Mr. Gall's talk a liberal amount of time has been left open for general discussion, and at this time those present will be accorded the privilege of asking him questions from the floor. If problems have arisen in the conduct of your business during the past year in connection with the Fair Labor Standards Act, the Labor Relations Act, or any other Federal statutes, be sure and bring them to the Convention for clarification.

The business meeting of the Convention will immediately follow this discussion. Reports will be received and acted upon from the Resolutions Committee, the Auditing Committee and the Nominating Committee. Election of officers will then take place, following which the afternoon session will be concluded.

This, however, by no means terminates the Convention program for on Wednesday evening there will be held a Convention Cabaret, purposely scheduled to take place after the business side of the Convention has been concluded. This affair has enjoyed enthusiastic approval for many years. An excellent floor show is being provided for the entertainment of those present and liberal opportunity will be afforded throughout the evening for dancing. All in attendance will wish to take advantage of this last opportunity to get together socially and we are confident that the Convention Cabaret will mark an appropriate conclusion to our 23rd Annual Convention.

Again let us say, we earnestly believe this represents one of the best prepared programs in our history. The topics are of paramount importance and will be presented by men outstandingly qualified to discuss them. This will be to little point, however, unless the members of the industry are there to profit by these discussions.

During the recently concluded sessions of the Congress of American Industry held in New York City and concerning which you have no doubt read much in the current press, the thought was often repeated that the system of private enterprise as followed in this country since its inception has been largely, if not entirely, responsible for our greatness. Today there are many who would so drastically modify that system as to jeopardize its continuance. Upon us who believe in the system of individual enterprise a grave responsibility rests to do all within our power, individually and collectively, to guarantee its continuance and mindful that it is not perfect, to intelligently endeavor to improve its operation.

By staying at home when our industry is on the march to its Annual Convention, we fail to assume the responsibilities of citizenship in the industry which gives us our livelihood. Your place, *Mr. Crushed Stone Producer,* on the 22nd, 23rd, and 24th of January next, is at the Hotel Jefferson, St. Louis, Missouri, where your industry meets in Annual Convention to review both the errors and accomplishments of the past and in the light of such experience to more intelligently plan for the future. *We confidently expect you to be there.*

George F. Schlesinger

To his host of friends in the highway field, the untimely passing of George F. Schlesinger, Chief Engineer and Secretary of the National Paving Brick Association, Washington, D. C., came as a severe shock. Mr. Schlesinger died after a heart attack at his home at three o'clock on Friday morning, December 1. Since September 1938 he has served as Treasurer of the American Road Builders Association and for many years has been Secretary and Treasurer of the Manufacturers' Division of the American Road Builders Association.

To his family and to the National Paving Brick Association which he served so ably for many years, we extend our deep sympathy for the irreparable loss they have suffered.

Thomas A. Lanagan

It is with very real regret we announce the death of Thomas A. Lanagan at Newton, Mass., on November 28. Mr. Lanagan, as will be recalled by his many friends throughout the crushed stone industry, was the sales manager in charge of Massachusetts operations at Winchester and Worcester for the General Crushed Stone Company. Mr. Lanagan had been associated with the General Crushed Stone Company for about 20 years.

Our deepest sympathy is extended to his family and to the organization which he served so well.

Studies of Subgrade Pressures Under Flexible Road Surfaces[1]

By A. T. GOLDBECK

Engineering Director, National Crushed Stone Association

• It seems almost unbelievable that there is no generally accepted method for determining by theory the load-carrying capacity of roads of the non-rigid type. The present tests are intended to at least shed light on this somewhat involved subject.

IT IS the purpose of the present paper to present the results of some preliminary tests made to determine the subgrade pressures under flexible road surfaces of different thicknesses. The results have not reached the stage which will permit of generalizing them into a theory for flexible road design, but, none the less, light is thrown on distribution of pressure to the subgrade and on the effect of differences in thickness and rigidity of the flexible surface on subgrade pressure distribution.

Method for Measuring Pressures

The tests were conducted in the laboratory making use of a bin constructed of heavy timber backed with I-beam supports. See Fig. 1. The base of the bin

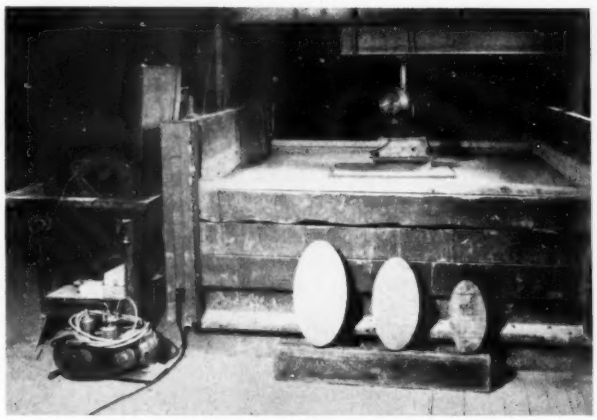

FIGURE 1.

APPARATUS FOR MEASURING SUBGRADE PRESSURE

Here is shown the 6 ft. square by 3 ft. high bin with the hydraulic jack mounted for applying load. The different size elliptical bearing blocks correspond with the contact areas produced by 4,000, 8,000 and 12,000 lb. wheel loads. On the left is the pressure gauge box to which is connected a soil pressure cell mounted on the subgrade under the stable surfacing material.

was designed for rigidity. The soil pressure measurements were made by the use of a soil pressure cell such as described by the author before the last annual meeting of the Highway Research Board.[2]

In the bin was first placed a sand-clay mixture which had previously been mixed with the desired amount of water to give it the necessary degree of stability. If a soft subgrade was desired, additional water was used in the mix. The subgrade, 18 in. thick, was rolled in layers 3 inches in thickness by the use of a sheep's foot roller made with concrete disks alternating with disks having a toothed circumference. This roller was followed by a heavy hand concrete roller of cylindrical form. The characteristics of the subgrade materials used in these tests are shown by a series of laboratory tests made through the courtesy of the American Bitumuls Company.

TABLE I

CHARACTERISTICS OF SCREENINGS SURFACE

Material: Limestone Screenings.

Gradation:	*Sieve*	*Per cent passing*
	¼"	100
	#10	82.4
	200	23.9

Stability (Punching Shear Tests)

% Moisture	1.9	3.4	6.5	9.68
Punching Shear	5300	4500	2700	3400

Screenings were compressed at moisture content of 6.5 per cent, then air dried to respective moisture contents.

CHARACTERISTICS OF SUBGRADE

Material: Sand-clay Mixture

Gradation:	*Sieve*	*Per cent passing*
	¼"	100
	#10	99
	200	36.2

Stability Test

% Moisture	3	5	6	7	9	10	12
Stability (½" bottom layer)	40,000 +	40,000 +	29,000 −	15,000	7,500	2,900	0

(Tests performed in laboratory of American Bitumuls Company)

It was decided that the most convenient surfacing material to use in these preliminary tests would be

[1] Presented before joint meeting of Dep'ts of Soils and Design, Highway Research Board, December 5, 1939.

[2] See Highway Research Board Proceedings for 1938, Part II, p. 66.

stone screenings, for they could be very readily mixed with water and laid in a homogeneous layer and could be well compacted in the laboratory bin with the method just described. The present tests

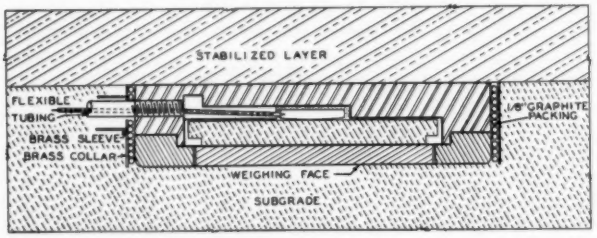

FIGURE 2.

SOIL PRESSURE CELL

were all made with stone screenings as the surfacing layer, laid to different thicknesses and allowed to dry to different amounts depending upon the rigidity desired. When first laid and rolled, the wet screenings did not have a great deal of stability, but, on the other hand, as they dried they attained high stability and apparently even had bending resistance until cracks were formed under the test load.

The method of installing the soil pressure cell and its location were subject to change as experience was obtained during the progress of the tests. It is recognized that the soil pressure cell, having a thickness of about 1½ in. and having rigidity, theoretically is not an ideal device for this particular kind of pressure measurement, because it introduces a rigid element into the subgrade structure which has possibilities of producing error. These possibilities were fully recognized before the tests were begun but it is believed that with the methods used, an accuracy has been attained which is in keeping with the kind of measurements taken and the use for which they are intended.

The soil pressure cell was installed in the center of the bin, in all cases with the weighing face down in contact with the subgrade. In some cases the cell was first laid on the subgrade before applying the screenings and rolling them. In other cases, especially where unstable screenings were used in the

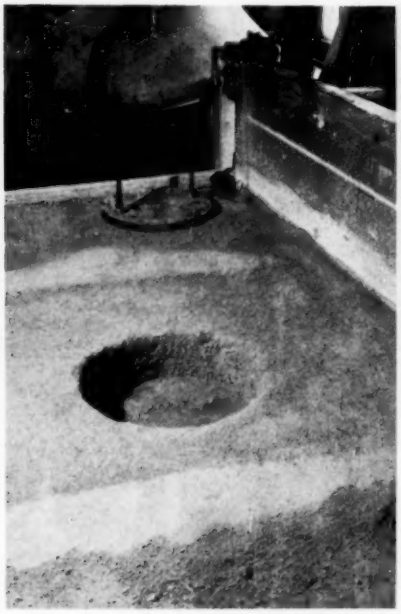

FIGURE 3.

Hole dug through screenings layer preparatory to making load-indentation or bearing value test on subgrade.

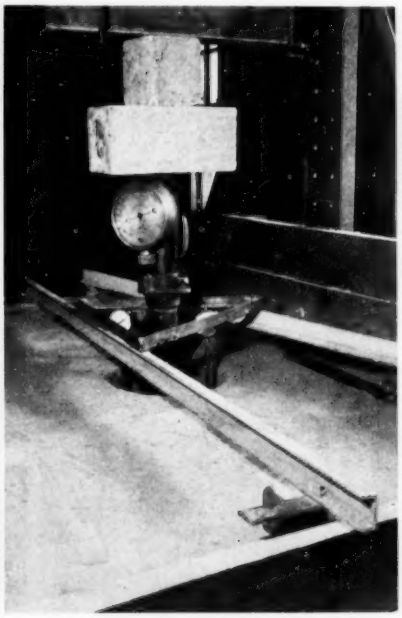

FIGURE 4.

Making load-indentation (bearing value) test on subgrade. Bearing block, circular, with 100 sq. in. of area. Indentation is determined with two dials reading to 0.001 in.

FIGURE 5.

Appearance of screenings layer after making load-indentation test; circular bearing block, 10 sq. in. in area. Note the surface along which shearing action occurred during the test. Through the underlying cone the load is carried to the subgrade.

test, the cell was placed with its weighing face one and one-half inches below the surface of the subgrade. In this type of installation, however, the cell was surrounded with a brass collar loosely filled with a graphited gland packing so as to eliminate friction between the sides of the cell and the surrounding collar. See Fig. 2. In theory the unit pressure on the weighing face of the cell would be the unit pressure at the base of the cell which was set level with the surface of the subgrade.

Method of Load-Application and Load Measurement

Loads were applied through elliptical bearing blocks designed to have an area equal to the area of contact of tires suitable for 4,000, 8,000 and 12,000 lb. loads respectively. The dimensions of these blocks and the unit pressures equal to the appropriate tire pressures and the areas of contact were as follows:

TABLE II

DATA ON BEARING BLOCKS

Long diameter 2 A (in.)	Short diameter 2 B (in.)	Area sq. in.	Total Load lb.	Unit Load lb. per sq. in.
12-1/8	6-1/16	58	4,000	69.0
15-3/4	7-7/8	97	8,000	82.5
18-1/8	9-1/16	130	12,000	92.3

In all cases the bearing block was first set on a ½ inch rubber pad placed on the wearing surface. A hydraulic jack was used for applying the load. This jack was calibrated frequently to insure continued accuracy.

The procedure in taking measurements was to place the bearing block at the side of the bin and pointing toward the cell; load was applied and pressure readings taken on the cell. Zero load subgrade pressure readings were made before and after each load application. The block was then advanced a short distance and was again loaded and the pressure readings taken. This procedure of loading and advancing the block was repeated until the block was centered over the cell. In this manner an influence line for subgrade pressure was obtained and the pressures would thus represent the increase in pressure at any given spot on the subgrade as the load was advancing toward that spot. This is the condition of loading which actually exists as a truck wheel operates on a road surface. It would seem reasonable to believe that this influence line for pressure likewise very closely represents the actual distribution of longitudinal pressure. It is believed that substantially the same results are obtained by this method of loading and by the use of a single cell as would be obtained were a number of cells installed to determine the pressure distribution.

The method used has the advantage of subjecting the subgrade to advancing pressures such as would obtain under actual loading conditions. From our tests we know that the mere fact of having loaded the surface in a given zone, results in the compaction of the subgrade in that zone. This compaction increases the subgrade resistance in the zone which has been loaded as compared with the unloaded zone.

In a manner similar to that just described, lateral distribution of pressure was obtained, the bearing block in this case being advanced laterally, rather than longitudinally.

Load Indentation Characteristics of Subgrade and of Surfacing Material

A series of subgrade pressure-distribution tests would not be complete unless they were supplemented by tests to determine the respective bearing values of the subgrade and of the surfacing material. It seems reasonable to assume that if the maximum pressure on the subgrade exceeds the load-support-

Test No. 2

4" Screenings on 18" Subgrade
Moisture:—Screenings 3.4
Subgrade 9.4

Longitudinal Loading
Single Block

Total Load	Unit Load-PSI
○ 4000	69
△ 8000	82.5

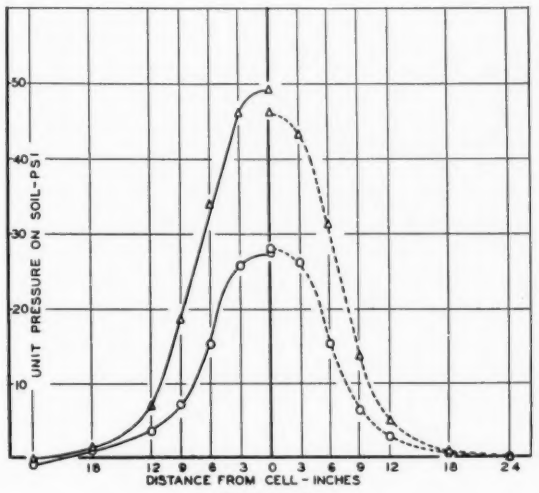

FIGURE 6.

ing value of the subgrade when the load is applied, then that particular combination of surfacing material and subgrade is in danger of failure. It becomes highly important, therefore, to determine the load-supporting value of the subgrade in order to determine if the maximum subgrade pressure is approaching or even exceeding the subgrade supporting value. Undoubtedly, the surfacing material gives some degree of confinement to the subgrade and, furthermore, it would seem desirable to make a load-supporting value test on the subgrade in its undisturbed condition. Having these two points in mind it was decided to make load-indentation tests on the subgrade in the following manner.

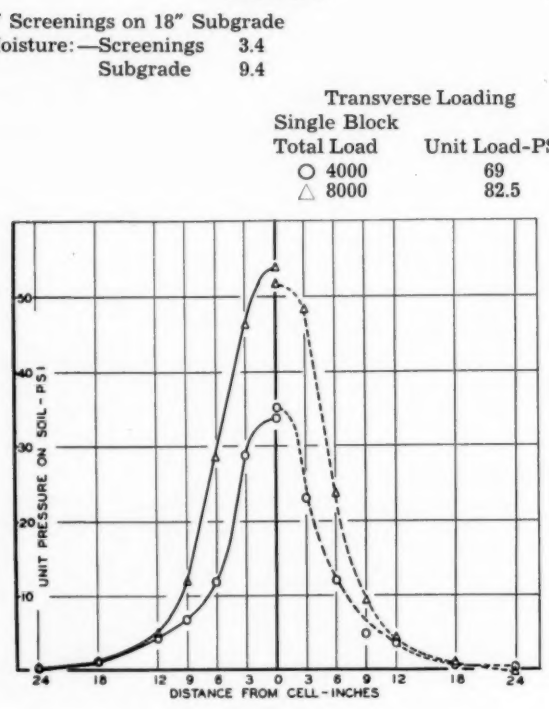

FIGURE 7.

The design of the apparatus and its load-carrying capacity as a whole was such that a bearing block 100 square inches in area seemed appropriate. A hole, Figs. 3 and 4, approximately one-half inch greater in diameter than the diameter of the block was very carefully formed in the surfacing material and after very carefully scraping the subgrade material to a level, flat surface, the steel bearing block was mounted on it and very slowly load was applied by means of the hydraulic jack. Simultaneously, indentation readings of the bearing block into the subgrade were taken. The first tests were performed by the continuous application of load and by the measurement of indentation through the use of a steel scale. But as refinements were developed in the method, load was applied in increments and after each increment of application, a period of one minute was allowed to elapse and indentation readings were taken by the use of two Ames dials reading to 1/1000 of an inch. In this way a load-indentation curve was obtained and since the time intervals are alike the respective curves on different subgrades should be comparable.

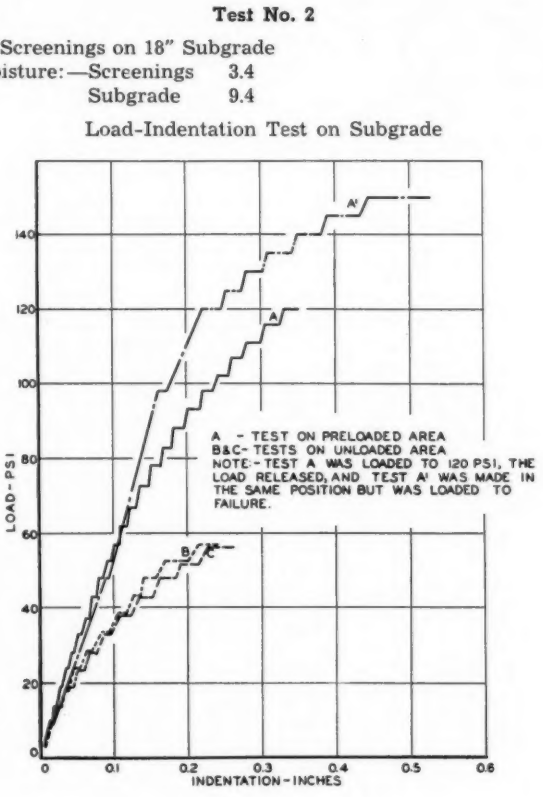
Test No. 2
4" Screenings on 18" Subgrade
Moisture:—Screenings 3.4
Subgrade 9.4
Load-Indentation Test on Subgrade
A - TEST ON PRELOADED AREA
B&C - TESTS ON UNLOADED AREA
NOTE: - TEST A WAS LOADED TO 120 PSI, THE LOAD RELEASED, AND TEST A' WAS MADE IN THE SAME POSITION BUT WAS LOADED TO FAILURE.
LOAD - PSI
INDENTATION - INCHES

FIGURE 8.

In a similar manner load-indentation tests were made on the surfacing material and these tests may be taken as a measure of the physical properties of this material. In the case of the surfacing materials, however, a bearing block having only 10 square inches was employed, because were a large block to be used, the subgrade would contribute to the inden-

tation. In this test it was desired that the indentation be confined entirely to the surfacing material if possible. By the use of a small bearing block of 10 square inches placed on the surfacing material, this objective was in large measure accomplished. The conical portion, sheared from the screenings layer during the test is shown in Fig. 5.

It no doubt would be desirable if additional tests could be made in the nature of an extrusion or punching shear test, especially if the samples could be taken from the subgrade and surfacing materials respectively in their undisturbed condition. In the absence of these, however, it is felt that the present load-indentation tests will serve a very useful purpose in identifying and relating subsequent tests to those at present described. All of the pressure readings will not be given at the present time, but merely typical curves to show some of the extremes of pressure obtained.

Test No. 2

4" Screenings on 18" Subgrade
Moisture:—Screenings 3.4
Subgrade 9.4

Load-Indentation Test on Screenings

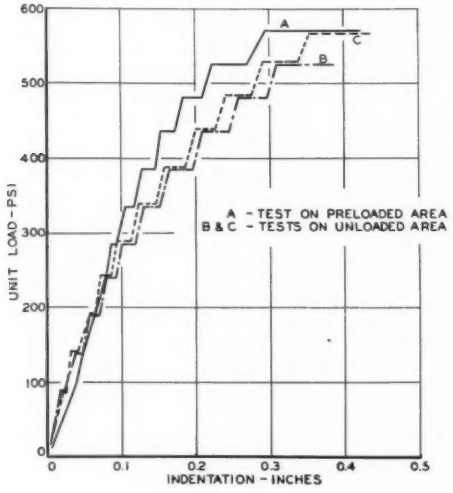

FIGURE 9.

Curves Showing Test Data

The following curves of test data have been selected from the tests thus far made in order to bring out the influence on maximum pressure and pressure distribution of variables in the thickness and rigidity of subgrade and wearing surface. Also, they show the influence of the magnitude of load applied.

In the first test (Fig. 6) the screenings were 4 in. thick, had only 3.4 per cent moisture and were very stable. The subgrade had 9.4 per cent moisture and it likewise was quite stable. Four thousand and 8000 lb. wheel loads were applied on their respective bearing blocks with the resulting pressure distribution shown. Roughly, 48 lb. per sq. in. was the maximum pressure on the subgrade under the 8000 lb. wheel load and 28 lb. per sq. in. under the 4000 lb. wheel load.

Test No. 1

6" Screenings on 18" Subgrade
Moisture:—Screenings 3.8
Subgrade 9.2

Longitudinal Loading
Single Block

Total Load	Unit Load-PSI
○ 4000	69
△ 8000	82.5
× 12000	92.5

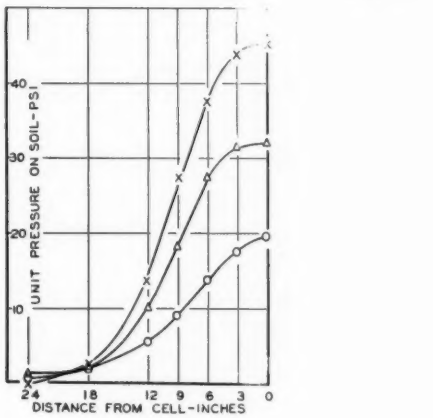

FIGURE 10.

The lateral pressure distribution for the above described conditions is shown in Fig. 7. It will be recalled that the bearing block is advanced transversely in making these tests for transverse distribution and in view of the fact that a center zone of pressure is created by virtue of the prior application of the bearing block, in all probability there is a higher concentration of pressure on this center zone than in those portions of the subgrade to which direct application of pressure has not been applied. It has been noted time and again that in those spots in the subgrade which have received prior compression in excess of that received in other spots, there is a tendency for higher pressure concentration in the compressed portion. This fact makes it extremely difficult to obtain closely concordant check readings, but

at the same time it demonstrates the lack of necessity for extreme accuracy in making tests of this character. We are dealing with a plastic material in both the subgrade and the wearing surface, or at least an inelastic material, and pressure conditions are changing rapidly during the making of the test. In Fig. 7 it will be noted that the highest lateral pressures are spread out less than the high longitudinal pressures in the vicinity of the bearing block where most of the pressures are concentrated.

Test No. 6

8" Screenings on 18" Subgrade
Moisture:—Screenings 3.5
Subgrade 8.3

Longitudinal Loading
Single Block

Total Load	Unit Load-PSI
○ 4000	69
△ 8000	82.5
× 12000	92.5

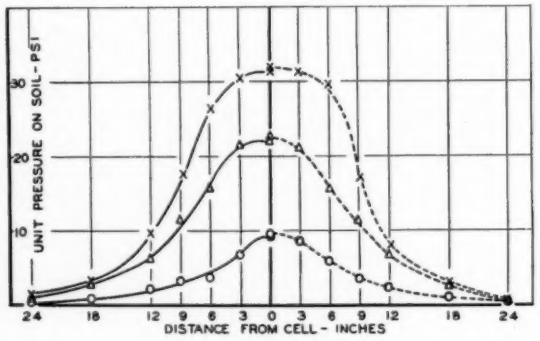

FIGURE 11.

In Fig. 8 are shown typical load-indentation tests on the subgrade. The stepped shape of the curve is due to the interval of one minute after applying the load, during which indentation of the bearing block is taking place. The slant portions of the curve represent the intervals during the application of the load increments. The load increments are applied in a fraction of a minute, but not in a definite time interval. Curves B and C were obtained on those portions of the subgrade which had not been loaded by the bearing block while tests A and A′ were made on the central portion of the bin where the bearing block had been previously applied in making the load-distribution tests. Thus, the mere fact of loading the surface has increased the resistance of the subgrade to a very great extent. This test indicates that the subgrade is improved by the action of traffic, due no doubt to its greater compaction. This compacting action of traffic has of course been observed also in practice.

Note that there is a more or less definite yield point beyond which the subgrade yields at a higher rate. It would seem reasonable to use Curve A as the curve which represents the significant pressure-indentation characteristics of the subgrade, for it probably would more nearly approach the condition of a subgrade in service after having been subjected to traffic. If this assumption is valid, then it would seem that the bearing value of this particular subgrade might be taken at around 65 lb. per sq. in., this point being that beyond which the curve deviates rather rapidly from the straight line.

Test No. 9

6" Screenings on 18" Subgrade
Moisture:—Screenings 6.0
Subgrade 10.0

Longitudinal Loading
Single Block

Total Load	Unit Load-PSI
○ 4000	69
△ 8000	82.5

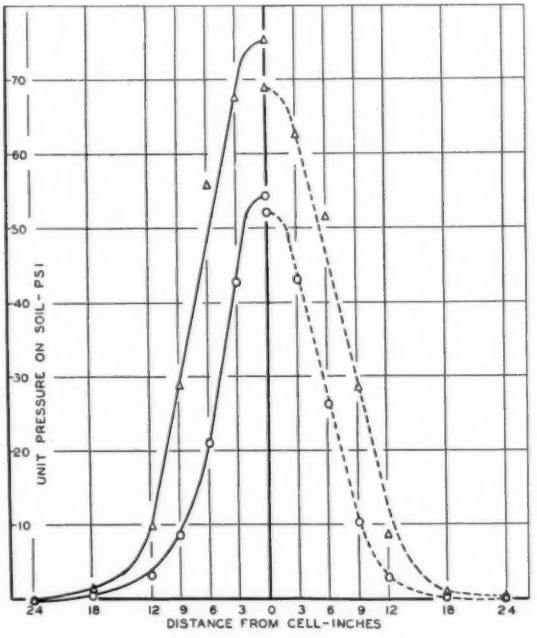

FIGURE 12.

In Fig. 9 are shown typical load-indentation tests on the screenings surface. Since this particular sur-

face contained only 3.4 per cent of water, the screenings were very stable as shown by the fact that rapid yielding did not take place until after a load of approximately 350 lb. per sq. in. was applied. It is of course somewhat indefinite as to what point on the load-indentation curve may be considered as the bearing value of the material. The selection of this point needs discussion and clarification. Perhaps it should be selected at a definite indentation, such as 0.1 inch.

Fig. 10 is to be compared with Fig. 6. The moisture conditions in the screenings and subgrade are not ex-

Test No. 9

6" Screenings on 18" Subgrade
Moisture:—Screenings 6.0
Subgrade 10.0

Load-Indentation Tests

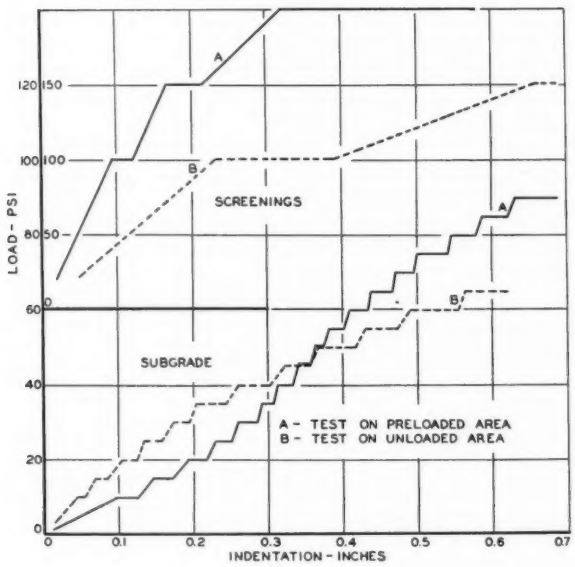

FIGURE 13.

actly alike, but they are closely comparable. Here, the surfacing material was 6 in. thick instead of 4 in. as in Fig. 6. It will be noted that the maximum subgrade pressures are reduced. It was found possible to apply a 12,000 lb. wheel load on the 6-inch material without failure, whereas only 8,000 lb. could be applied in the case of the 4-inch layer.

In Fig. 11 eight inches of stabilized screenings were used instead of 6 inches as in Fig. 10 and 4 inches as in Fig. 6. Here, again, a very great reduction in the subgrade pressures is noted. The pressure under the 12,000 lb. wheel load in Fig. 11 is no greater than that due to the 8,000 lb. wheel load in Fig. 6.

In contrast with the prior results, the tests shown in Fig. 12 indicate the high pressures which are possible when the surfacing layer is unstable. Here, the

MAXIMUM SUBGRADE PRESSURE OBTAINED UNDER VARIOUS CONDITIONS

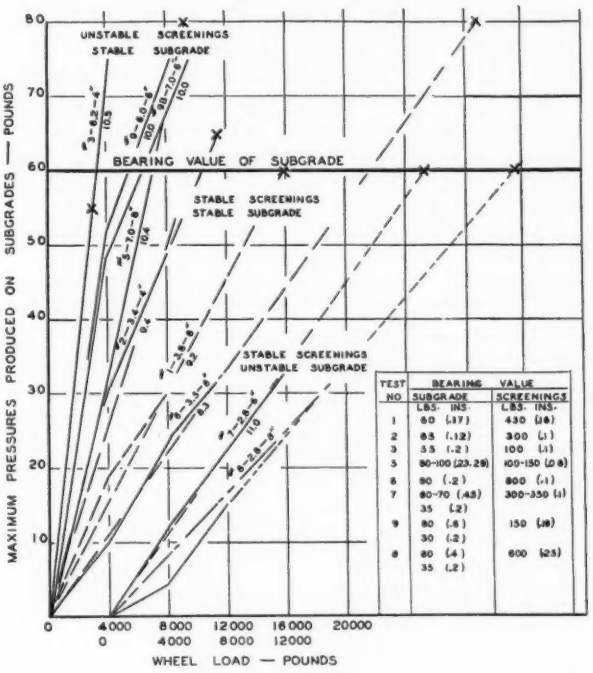
MAXIMUM PRESSURES PRODUCED ON SUBGRADES — POUNDS
WHEEL LOAD — POUNDS
UNSTABLE SCREENINGS STABLE SUBGRADE
BEARING VALUE OF SUBGRADE
STABLE SCREENINGS STABLE SUBGRADE
STABLE SCREENINGS UNSTABLE SUBGRADE
TEST NO | BEARING VALUE SUBGRADE LBS. INS. | SCREENINGS LBS. INS.
1 80 (.17) 430 (.8)
2 85 (.12) 300 (.1)
3 35 (.2) 100 (.1)
5 90-100 (23.29) 100-150 (.08)
6 80 (.2) 800 (.1)
7 80-70 (.48) 300-350 (.1)
35 (.2)
9 80 (.8) 150 (.18)
30 (.2)
8 80 (.4) 600 (.25)
35 (.2)

FIGURE 14.

screenings layer has 6 per cent of moisture and it will be noted that under the 8,000 lb. wheel load, something over 70 lb. per sq. in. maximum pressure was attained.

The influence of the high per cent of moisture on the stability of the screenings is well shown in Fig. 13. Note that the bearing value of these screenings is only about 100 lb. per sq. in. as contrasted with 350 lb. per sq. in. with a low percentage of moisture. It is also seen that the subgrade in this particular case was none too stable. At least it showed a high indentation under the application of load.

The results as far as maximum pressure intensities under different wheel loads are concerned, are summed up in Fig. 14. The ordinates are the maximum pressures obtained on the subgrade under the center of the wheel load. A very great contrast in these pressure intensities is evident. For illustration,

in test No. 3, made with 4 inches of screenings having a high percentage of moisture, a 4,000 lb. wheel load shows a maximum pressure intensity of well over 70 lb. per sq. in. This probably is in excess of the bearing capacity of the subgrade. When the screenings layer was stabilized by drying it out to only 3.4 per cent moisture, the pressure intensity on the subgrade due to a 4,000 lb. load was reduced to only 30 lb. per sq. in., well within the bearing capacity of the subgrade. It is indicated that this layer, with an 8,000 lb. wheel load had a maximum subgrade pressure of only 49 lb. per sq. in., apparently also well within the bearing capacity of the subgrade. The effects of other combinations of wheel load, surfacing, thickness and condition of the subgrade are shown in Fig. 14.

Conclusion

Most of the theories for the design of the flexible road have assumed that the subgrade pressure is uniform in intensity and that it occupies an area which is confined within lines sloping outward from the area of surface contact, generally at 45°. Some of the older theories even ignore the fact that there is an area of contact between the tire and the road. It is quite evident that these theories are fallacious for the pressure intensity is not uniform.

No attempt is made at the present time to formulate a theory of design. It is too early for that, but rather are the present tests aimed at obtaining results which may later be of value in the formulation of a theory. It is hoped that ultimately the tests will be made to include different thicknesses of typical flexible surfaces and typical subgrade materials. It is also proposed to pursue them in the field if possible.

The present measurements take no account of impact and field tests should be made to determine to what extent, if any, impact is an important factor. For this purpose different apparatus or a modification of the present apparatus will be necessary. The whole project of flexible road design is important enough to warrant cooperative tests to the end that more rapid progress might be made.

Highway Lighting as Influenced by Road Surface

HIGHWAY safety at night is closely related to the matter of visibility. It may be interesting to stone producers to know that investigations have been made looking toward an increase in visibility on bituminous surfaces and an investigation was recently conducted at Lynn, Massachusetts. The following is quoted from an article in the May 25, 1939, issue of the Engineering News-Record, by Mr. C. A. B. Halvorson, Consulting Engineer for the General Electric Company:

The original pavement was an open-type, bituminous macadam with a black surface of the semi-diffusing type, having the minimum value of reflectance. The illumination was provided by modern luminaires spaced 110 ft. apart and fitted with 400-watt Mazda lamps. As shown by the *before* view, the lighted surface appears as small spots of brightness alternating with large splotches of darkness. Four targets 4 ft. square having their surfaces painted vertically, half white and half black, were placed in the travel lanes on both sides of the roadway at distances of 100 and 200 ft. from the observers. The white portions of all four targets, because of their high reflectance and brightness, were easily perceived. In only two cases was it possible to see the black target areas and in both the black halves of the targets were seen because they were against the relatively bright areas of the pavement.

The same pavement was then resurfaced with Chelmsford granite chips, ½ to ¾ in. in size, glued to the old pavement with a thin layer of asphalt. This produced a diffusing or matte-surface pavement of about 30 per cent reflectivity. Lighting conditions were the same as in the previous test, and the targets were placed in the same positions as before in left- and right-hand lanes of the highway. In this case, the pavement surface appeared bright throughout and the black areas of all four targets were clearly visible. There were no areas of darkness wherein objects could be partially concealed.

Measurements show that night lighting, directed uniformly on this surface from overhead, reflected uniformly over its whole area. In bright sunlight the surface was found to be appreciably less bright, when facing the sun, than an ordinary dark pavement having a high degree of specular reflection. Still another great advantage was found when the pavement floor was covered with water, as it would be during a rain. The surfaces appeared uniformly bright due to the sides of the chips standing above the water film. With lighting from automobile headlamps alone the visibility distance was increased several times. Under a cloudy sky the pavement appeared uniformly bright.

The tests were carried out by the city officials, a joint committee of the Asphalt Institute and the Illuminating Engineering Society, and the author.

Free Enterprise vs. Feudalism[1]

By PAUL G. HOFFMAN
President of the Studebaker Corporation

• Real concern is evidenced in many quarters concerning the future of private enterprise in America. Many of the dangers which threaten this bed-rock upon which our industrial and economic success has been built are easily recognized. But those which are not are most to be feared. It is the latter with which Mr. Hoffman deals in the following article. His penetrating and enlightening analysis is a timely warning which should be read by every business man.

ON FEBRUARY 5 of this year, Dr. Bruning, the last Chancellor of free Germany, told me that if there was war, Germany and Russia would be allies, because, as he said, their ideologies are similar —both are feudalistic in concept. By his use of the word "feudalistic," he implied that there was nothing new about the modern isms, that they were merely a streamlining of the old idea that the individual is a servant of the state. He might have used the adjective "tribal," because in ancient times the same belief prevailed almost universally. As a matter of fact, of the thirty-eight to forty billion people who have lived since the beginning of the Christian era, less than one billion have ever known the meaning of personal liberty and economic freedom. No, there is nothing new about the idea that rulers should completely control the lives of the people.

The new idea—the dynamically new idea in human history is that individuals, if given a reasonable opportunity for a free expression of their abilities, can bring about a higher standard of living and a better social order for *themselves*. Speaking broadly, that concept is only about two hundred years old. It has had application in only a few countries—in modern England, France, Holland, Sweden, Norway, the United States, and some smaller countries, and for a comparatively brief time in central Europe. It is worth noting that only the billion who have enjoyed freedom have ever experienced an improved standard of living. The common man in all totalitarian countries, from the days of the tribal chiefs to present day dictators, has lived either at a subsistence or starvation level. The burning issue at the present time is whether the concept of individual liberty and economic freedom shall live or perish from the earth.

I do not propose taking time for any impassioned appeal for the preservation of individual liberty. I assume that you are as determined as I am that there shall be no turning to feudalism as far as America is concerned. I have no fear of the enslavement of free Americans by any sudden military coup, or by any legislative action by which we will vote ourselves into bondage. There is no prospect of a blackout of freedom in America. I do believe that there is danger of a fadeout as a result of certain pressures which threaten free enterprise. I do not need to remind you gentlemen that personal liberty and religious freedom cannot survive if free enterprise is supplanted by regimentation. Speaking historically, civil and religious liberties have always followed and not preceded the breaking of governmental controls over the market. In England, France and Holland, people gained civil and religious liberty after they had fought for and won the right to conduct free business enterprise—not before. In Germany and Italy on the other hand, as we have seen in our own day, the people lost their civil and religious freedom after they lost free enterprise. We must either maintain free enterprise or accept feudalism.

The outward and visible manifestation of the hazard to free enterprise is the excessive and constantly mounting burden of federal, state and local taxation. Some years ago I heard a most challenging address in which the speaker analyzed the fall of civilizations. It was his theory that either anarchy or regimentation was inevitable once taxation reached a point where it was absorbing in excess of from 35 to 45 per cent of national income. He first recited the case of ancient Egypt where the mounting expense of the Priesthood eventually absorbed more than half the earnings of the producers, with the result that there was revolution and chaos. He then laid before us the history of Greece where the expense attendant upon the conquests of Alexander finally brought about a similar disaster. Then he showed how in more modern times in France the nobility took such a toll from the workers that revolution became inevitable.

Let us see what is happening in America. In the year of 1913, our national income was $31,450,000,000. Federal, state and local taxes were approximately $2,194,000,000, or 7 per cent of the national income.

[1] Presented before the American Petroleum Institute's Twentieth Annual Meeting at Chicago, Illinois, on November 15, 1939.

Twenty-five years later, or in 1938, national income was $62,450,000,000—approximately double that of 1913. Ordinary governmental expenditures were $17,100,000,000, which was 27 per cent of national income. Of this amount, $13,700,000,000 was raised by taxes and the balance by borrowing. In addition to the ordinary expenditures, our government incurred additional contingent and credit liabilities of $3,700,000,000, bringing the total to $20,800,000,000, or 33 per cent of national income. Governmental expenditures were almost ten times what they were twenty-five years ago; whereas, national income was just double. We are approaching the danger point!

There are those who contend that the best method to reduce this dangerously high percentage of national income being taken by taxes is through a drastic reduction in governmental expenditures; others, with equal vehemence, argue that the only answer is a sharp increase in national income. It is my opinion that we must move in both directions. However, neither howling about expenditures nor shouting for prosperity will suffice. Before we can proceed intelligently, we must find out *why* governmental costs are high and, secondly, *why* national income is low. An adequate answer to either of these questions would take hours which are not available and a profound knowledge which I do not possess. I shall limit myself to making certain observations, with the full realization that they do not constitute either complete or authoritative answers to either question.

Let us first consider this problem of reducing governmental expenditures. Obviously the first attack should be on the wasteful use of tax money. Everyone recognizes that it is difficult to get full value for a tax dollar. When we think of governmental expenditures, we think of the Federal Government, forgetting that there are 175,000 governmental spending units in the United States. It seems to me that the most sensible approach to this problem of eliminating the wasteful use of tax money is contained in the recommendations of The Tax Foundation, of which Mr. Lewis H. Brown is Chairman and Mr. Fred A. Eldean, formerly of the American Petroleum Institute, is Executive Director. They suggest that the tax battle will be won in the county, just as national elections are won in the precinct. They urge that the county taxpayers organize and subject county expenditures to an intelligent audit and analysis. State organization proceeds naturally from county organization. The State of Nebraska has more or less provided the pattern where during 1938 the Nebraska Federation of County Taxpayers Leagues, working with public officials, brought about tax savings of $139,000,000 and a reduction in debt for local governmental units totaling $39,000,000. It would seem evident that this technique is sound. Our need is for its application in a wider area.

In addition to curtailing the wasteful use of tax dollars, we face the equally important problem of *how* taxes should be raised. This is particularly true insofar as it applies to the Federal Government. At best, taxes are a retardant to business, but a given amount of taxes raised in one way may leave our economy functioning, and in another seriously cripple it. Let us, for example, consider the effect of present federal taxes on venture capital, which has been virtually driven from the market.

Merle Thorpe, editor of Nation's Business, in an address delivered nearly a year ago, told a story in one succinct paragraph which I want to quote. Mr. Thorpe said:

"It is a fact that from 1900 to 1930 three billions each year of new capital, or savings, went into the development of new things, and another three billions into the expansion of industries already established. Eighteen of these new things, such as automobiles, radio, rayon, today furnish employment to nearly ten million wage-earners, one-fourth of the total number of those employed in gainful occupations. Since 1930 less than one-tenth of three billion dollars each year has ventured in this way."

Along with other business men, I have ideas as to what might be done to free up venture capital. For example, I concur with Mr. H. S. Vance, who is Chairman of our Board and who was a member of the Fortune Round Table on Taxation, that great benefit would come from a further revision of our method of taxing capital gains as distinct from ordinary income. The low rates on capital gains established by the 1938 Tax Act were calculated to attract venture capital. Failure to produce the desired result is due solely to the retention of the time restriction that securities must be held at least eighteen months before gains can be segregated. When one considers the obvious uncertainties which hang over all business transactions today, eighteen months is a long time. In Mr. Vance's opinion, the time restriction should either be eliminated entirely or reduced to an extremely short period. The only objection which has been raised to this is that it might encourage speculation, particularly by people of moderate means. Apparently due consideration has not been given to the fact that up to the $18,000 level the rate of income tax under our present laws is less

than 15 per cent. If a flat rate were applied without option, it would be a deterrent rather than an incentive to speculation so far as the vast majority of taxpayers is concerned. As it is, the time restriction has mitigated against the usefulness of the revision from a standpoint of encouraging venture capital, much of which must come from those in the higher income brackets.

Of far more importance than any specific change was the recommendation of the Fortune Round Table Conference, to which I have already referred, of the immediate appointment of an impartial, competent tax commission empowered to make a scientific study of our whole problem of federal taxation. We have among our congressmen some very able experts on taxation, but, insofar as possible, taxation must be moved out of the political arena if we are to have a sound system. So long as taxes are considered from the standpoint of producing the greatest revenue and losing the fewest votes, it is wishful thinking to expect anything other than continuing shocks to our economy. It may be wishful thinking to believe that even a plan recommended by nonpartisan experts could run the political gamut, but I am encouraged to believe that it might, because in 1924 the Socialist Labor Government in England appointed a commission headed by Lord Colwyn, and their program was accepted by Parliament.

The possibilities of such a study are limitless. The report issuing from it might well become our Magna Charta of taxation for years to come. The commission might well prepare schedules of tax sources and rates to meet budgets of varying sizes. It could formulate the ideal tax plan to meet the needs of a six billion dollar budget, a seven billion dollar budget, and so on to a ten billion dollar budget, pointing out the difficulties and the dangers of each progressive upward step in the total. Such a report would make visual to all the people their tax burden at various governmental cost levels. It would serve to protect this generation and the next against any further experimentation with tax devices intended primarily to promote social reform, to punish certain individuals or groups, or to achieve political advantage.

Perhaps the principal advantage that would come out of the local and state tax audits and analyses suggested by The Tax Foundation, and the tax commission proposed by the Fortune Round Table, are the questions that would be raised as to whether certain governmental services are worthwhile in view of the burden that they impose. I am of the opinion that even though taxes were raised in the most scientific manner and our tax dollars spent wisely, we would still be faced with a burdensome cost of government because we the people have demanded too much of government. During the last few years we have witnessd the sorry spectacle of organized groups from business, agriculture, and labor, fighting for their share of the loot in the form of subsidies or services. If free enterprise is to be saved, we have got to stop fighting separately for our share of the swag and unite in a battle to eliminate needless services. Any government will topple over if its citizens lean too heavily upon it. Only a self-reliant people can successfully carry on a government of the people, by the people, and for the people.

Now let us indulge in the brash assumption that governmental expenditures are cut by as much as one-third and that the tax program is sound. Will that insure real recovery in these United States? I don't think so. It will be merely a preface to recovery. Our big job is to substantially increase the national income. At the moment we are experiencing a kind of prosperity influenced, in part at least, by the war in Europe. Over the long pull, we would be far far better off without this stimulant. The big question is—What can be done to speed up our domestic economy so that under normal conditions we can look forward to a satisfactory and mounting level of national income? I don't pretend to know how far we can go in raising national income, but I do believe that within the next twenty-five years we can go far beyond the most optimistic figure that has yet been mentioned. Certainly anything less than $100,000,000,000 in the decade ahead would be an unsatisfactory goal. I have nothing new to propose as a basic solution, but rather a return to the old concept that the best way to expand markets, profits, and income is by maintaining or improving the quality of our products and selling them at a lower price. Business, labor and agriculture have all largely departed from this concept during this decade of depression. A return to it calls for a drastic change in both attitudes and actions.

In the field of agriculture an attempt has been made during the last ten years to solve its manifold problems by creating artificial scarcity and thus raising prices. I admit to a fundamental antipathy to such a procedure, but, at the same time, I recognize the natural resentment of our farmers against being compelled to sell on a free market when, according to their beliefs, both industry and labor benefit by monopolistic controls. Within the last year in talking to farmers, I have sensed a growing skepticism

as to whether the elaborate agricultural controls now in vogue will work to their advantage over the long pull, and a conviction that perhaps they can be made to work only by a complete regimentation of agriculture. An overwhelming majority of farmers are opposed to any such eventuality.

Labor has contributed to higher costs by undue emphasis on high hourly rates and by supporting legislation unduly restricting hours of work. Along with an overwhelming majority of industrialists, I firmly believe in high wages. We cannot have mass production without mass consumption. At the same time we cannot have mass consumption if the unit cost of our products is pushed up beyond the level where there can be mass purchasing. The building industry furnishes a notable example of the adverse effects on the worker of abnormally high hourly rates. The net result is such a scarcity of work that an increasing number of skilled artisans have had to go on relief. It is my hope that as labor leaders become more experienced, their viewpoint will be broadened and they will make common cause with employers, who are willing to broaden markets by lower prices and thus expand the volume of available work. Of one thing I am certain—we have got to work and not loaf our way back to prosperity.

Now I want to pay my respects to that section of the Wages and Hours Act which restricts hours of work. The operation of that law will inevitably bring one of two results. It will either decrease the annual earnings of workers, or raise the cost of goods if there is an adjustment in wages to make up for the lost hours of work. Even more important, it introduces the principle of controlling hours of work through legislation rather than through collective bargaining. I wholeheartedly believe in collective bargaining and feel that it is a necessary element in the functioning of a competitive economy. I am equally antagonistic to the idea of legislative control of hours of work, which, as I see it, belongs only in a regimented economy. I am certain that through collective bargaining management and men can work out a far better solution to this problem of hours of work than can legislators who have little knowledge of the manifold problems in the varied industries. The present law exempts workers in certain seasonal occupations, but practically all of industry is seasonal in character. As an example of how the law works, I should like to cite our own experience. Ever since early last spring, we have had more orders than we could fill. That situation has been aggravated this fall and yet we had to shut our plant down on Saturdays when the 42-hour provision became effective, because we can neither afford to open the plant for two hours nor can we pay overtime because our gross margins are too small. Our men would have been glad to work forty-eight hours in the peak season in the spring and in the peak season this fall, but they have been required by law to loaf and not work. Thus is free enterprise sabotaged, because, to function successfully, it must not be subjected to needless rigidities but, rather, it must have flexibility. It is my hope that labor, protected as it is by collective bargaining, will some day join with us in a fight to repeal this restrictive legislation.

Most business men are, of course, in complete agreement as to the desirability of having both agriculture and labor recognize the importance of expanding the volume of business through lower unit costs. As a rule, they feel pretty smug about business, and hold the view that we are the chosen defenders of free competitive enterprise, or the American way of life as it is sometimes put. I agree that most business men not only give lip service to free enterprise but are willing to take their chances in competing under the system. Unfortunately, business has been badly positioned by a highly articulate minority. That minority is likely to torpedo free enterprise unless it is stopped.

Let us first of all clearly define the relationship which should exist between government and business. Our government represents all the people and has not only the privilege but the duty of protecting their interests. In that area of our economy where monopoly is natural and most efficient, the government must assume a large measure of control. In that larger area where competition is the natural control from the standpoint of the consumer, then government has the obvious duty of maintaining competition and of protecting business men themselves against underhanded and unfair competitive attacks. The interests of the customer come first—as a matter of good business and as a matter of good government. Those of us in the competitive area should recognize the need for government policing, but resist efforts at governmental control. We should fight for those governmental activities designed to protect the customer. We should fight against any effort of the government to help us make profits—that's our job. We should fight to the death against legislation which has as its objective taking competition out of the competitive system, for in free competition lies the force which will operate inexorably to bring down costs and thus expand markets.

Where has articulate business stood on the maintenance of open competition? Business has had several clear-cut chances to express itself on this issue. One of the first was when N. R. A.'s Blue Eagle went on the hunt.

The N. R. A. was an experiment in fascist control of business. It was deliberately designed to control competition—not to promote it. If there ever was a time when every believer in the free competitive system should have shouted to high heaven, it was when that law was proposed. Actually the business men who did oppose it were conspicuous. Henry Ford stood out to the last. The Automobile Manufacturers Association, which includes all manufacturers except Ford, accepted a code for labor standards but refused, in spite of all kinds of pressure, to adopt a trade practice code. Here and there throughout industry arose other last-ditch fighters for free enterprise, protesting because they knew that free markets and free thought were inseparable; that political liberty could not survive alongside economic regimentation.

Today the N. R. A. is a dead issue. But its spirit lives and stirs and rises again in hydra-headed persistence. Since its demise, the Miller-Tydings Act has legalized price maintenance and price fixing. State fair trade practice acts have been passed in 44 states. Laws to license business leap from the floor of every state legislative session. This year in the State of Michigan alone twenty-six licensing bills were proposed by twenty-six business groups, all aimed at throttling free and open competition, all designed to put some competitor out of business.

More than 200 bills were introduced into 44 state legislatures this year with the objective of raising additional trade barriers between our various states. Already in existence are more than 300 such barriers to commercial intercourse between our states, most of them attempt on the part of some business group to get "protection" from competition; to dodge the hazard of letting the customer be his own judge and jury, as he must be in the court of true free enterprise.

Have business men condemned and fought against these attacks on our American system of free competitive enterprise? The answer must be a reluctant "no." The fact is that the state capitals and Washington, D. C., have been infested with business men seeking licensing laws or some other form of special privilege all aimed, as they put it, "to civilize competition."

Need these business men be reminded that the American Indians were civilized by the United States Government and that they are now wards of the government?

Granted that these business seekers after special privilege are in the minority. The great majority of business men have given tacit consent to such activities by their silence. They have not even been articulate in their recognition of the Federal Trade Commission as Public Friend Number One or free competitive enterprise. Charged with partial responsibility for maintaining open competition and with full responsibility for protectng business against unfair competitive attacks, this great agency has not always had the vigorous support of business. Minority groups have attacked it unfairly; there has been resentment of its so-called interference with business. These attacks have missed the main point. The Federal Trade Commission makes no attempt to control or manage business, but merely to police business to its own advantage. The theory of its operation is sound from the standpoint of preserving free competitive enterprise.

What I have been saying, in effect, is that business has a whale of a job of housecleaning before we can assert our right to leadership in this battle to save free enterprise. Those of us who believe in free competition must not only practice it but, in addition, must train our guns against those who seek a short-cut to profit by inviting legislative restrictions on competition. We must intensify our efforts to expand volume by doing the best job we have ever done in history for our lord and master—the American customer. If we so dedicate ourselves, we can, with justification, hope that agriculture will abandon its doctrine of scarcity, and labor its philosophy of high hourly rates and less work, and join with us in a determined effort to provide that more abundant life.

This is the appointed hour for action. Our country is not involved in war, and we are still free to fight against regimentation. If war should come—which God forbid—regimentation is inevitable, but by swinging into action now we can so fortify free enterprise that it could recover even from the shock of war. If, however, we are lulled into any false sense of security by the ephemeral war prosperity we are now experiencing, and continue to trade our liberty and freedom of action for special privilege or fancied security, free competitive enterprise might not survive even if peace continued. Involvement in war

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The Viewpoint of an Employer Toward Industrial Hygiene[1]

By ANDREW FLETCHER
Vice President, St. Joseph Lead Company.

• Is a company justified from a dollars and cents point of view in establishing a program of industrial hygiene? Judging from the phenominal success of the St. Joseph Lead Company, the answer is emphatically in the affirmative. There are many suggestions in the following discussion by Mr. Fletcher which should prove of practical help to crushed stone producers.

ALTHOUGH probably most companies and individuals will agree that improvement in industrial hygiene is advisable from an altruistic angle, there are many who have not had the opportunity of proving that a betterment will usually result in lower operating costs, and therefore an effective expenditure for improving working conditions is a good investment from the dollar and cents angle. I will briefly tell you the experience of the St. Joseph Lead Company, which is one of the oldest and largest mining and smelting companies in the United States.

Twenty years ago, before there were many laws covering industrial hygiene, the St. Joseph Lead Company realized that, in order to prevent its best men from entering possibly more attractive fields, it was necessary to have the best possible living and working conditions, so that a man could satisfactorily raise his family by sending his children to good schools and maintaining his and their health. From the following, in which the cost of labor turnover is estimated, it can readily be appreciated that we were not solely influenced by any legal, paternalistic or altruistic angle, but actually by a practical money-making viewpoint.

In 1918 our labor turnover was 250 per cent per year, in other words, it was necessary to employ 250 new men each year to keep 100 on the job. Therefore, to maintain our organization of some 2,500 men, we had to hire 6,250 men per year.

Based on an estimated direct cost of $20 to $25 to replace one man in 1919, the direct cost of 1919 labor turnover was $125,000 to $150,000 per year, which is the minimum figure, as it is difficult to estimate the indirect costs, such as additional supervision, increased accident hazard, decreased efficiency among older employees because of the necessity of giving attention to new employees, etc., but it is probably safe to say that the indirect equaled the direct cost; therefore the total cost of the labor turnover was $250,000 per year. I might add that under present day conditions, where machinery and brain work is necessary, instead of costing about $21.00 per man, the figure is nearer $100.00.

By 1926 labor turnover had been reduced from 250 per cent to 40 per cent per year, and by 1933 to 4 per cent. Last year it was 3.6 per cent—just compare this figure with the condition existing 20 years ago.

The actual dollar and cents saving indicated by the above was in part due to the following:

By asking our employees why they were quitting we learned of numerous reasons, such as: "poor living conditions", "poor schools", "no churches of their faith", "no facilities for recreation", "working conditions unhealthy and dangerous", "wages too low", "unfair treatment by foremen," etc.

Before taking any definite steps to rectify these apparent justifiable complaints, we made a study of our employment, wages, hours, working conditions, and also the training, safety, health and living, plus economic security. As a result of our investigations, we then:

Constructed an expensive water system.

Increased our taxes so that better schools could be provided, and improved company houses.

These improvements were completed over a period of a few years, and showed immediate results. But the betterment was not obtained merely through spending money. For example, a system of physical entrance examinations was instituted in order to avoid placing men on jobs for which they were physically unfit. This practice was and is most beneficial for men and company alike, as unknown physical defects have been found and also limitations, such as a weak heart, etc. I wish to emphasize definitely the mutual benefit of initial physical examinations as well as current ones made every two or three years. If a current examination shows that an employee cannot carry on with his job, he is shifted to a new position and he is paid the prevailing rate for the new job, even if it is lower than

[1] Presented at the fourth fall meeting of Air Hygiene Foundation, Mellon Institute, Pittsburgh, Pa., on November 15, 1939.

his former basis. If no job is available, or if he cannot work with safety to himself and his fellow employees, he is then pensioned. I know of no case where the employee was discharged because of his physical condition.

Our Southeast Missouri plants were and are entirely dependent upon the local labor supply. The school boys of today are our future employees. A check-up on the school children revealed 80 per cent under-nourished, and a study showed it was due to lack of milk. This was overcome in 1920 by starting a pasteurizing plant. Milk was sold at a low cost and given free in some instances, and within five years, the 80 per cent figure of under-nourished children was reduced to 17 per cent. To day the company maintains a herd of approximately 300 dairy cows. In addition to operating a dairy, we have a plant where ice cream and other milk products are manufactured, and also six company stores, which endeavor to maintain the lowest possible cost of living in the district. Through selling other stores in the district at the same wholesale prices as those on which our retail sales are based, other merchants in the area have been able to show profits without increasing prices materially above those maintained by our stores. Additional mutually satisfactory improvements were:

At our smelter there were 64 lead poisoning cases in 1920 in an organization of 400 employees. A study was made on the hazard, and as a result semi-annual general physical examinations and weekly physical inspections were instituted, a modern change room and a cafeteria were provided. Arrangements were made for employees to wear work clothing supplied and laundered by the company, and all employees were advised as to the importance of personal cleanliness in combating the lead hazard. A resident doctor not only examined the men, but also made periodic plant inspections to check conditions that might adversely affect health. As the result of careful supervision, lead poisoning is no longer a problem. As a matter of fact we have not had a case of lead poisoning for the last ten years.

Our miners could not obtain life insurance coverage, except at prohibitive rates, so a group life insurance plan was inaugurated, whereby each employee was given up to a maximum of $2,000 insurance at no cost to himself, and was permitted to buy $2,000 more at a low rate. A pension plan was instituted and has been revised from time to time.

It was also soon realized that, in addition to saving money through reducing labor turnover, it would be mutually beneficial to develop an efficient and competent safety department. The "money" results secured are indicated by the following statistics:

Frequency, or number of accidents per 1000 shifts worked has been reduced from .90 to the last five year average of .18.

Severity, or number of shifts lost because of accidents per 1000 shifts worked, has been reduced from 12 to 5.

Cost of accidents per $100 of payroll has been reduced from $2.25 to $1.25. A saving of $1.00 per $100 on a payroll of approximately $4,000,000 means a saving of $40,000 per year.

After an injured employee recovers from the immediate effects of an injury, he becomes restless and unless he be given something to occupy his time he may, through self-pity, become discontented and consider himself ill-treated, and when he returns to his regular work he is less cooperative and trouble is likely to develop between him and his foreman. We have therefore developed Rehabilitation Departments where injured employees are given work, at prevailing wages, as soon as possible without danger of adversely affecting their recovery. They are thus permitted to earn while they are convalescing and are usually willing and anxious to resume their regular duties as soon as they are able to do so. It has made the payment of accident compensation practically a routine matter, only rarely resulting in a controversy. The cost of operating a Rehabilitation Department has proven to be very little in excess of the value of the work performed by the injured employees. So again an action that was taken purely for the benefit of the employees has proven beneficial to the employer.

Another way that we have found for making our men more contented as well as saving money is by always endeavoring to make each individual job as "interesting" as possible. We have found that the American employee does very much better and more efficient work if the job is interesting and requires some "brain" work. Along this line we have endeavored to eliminate as much hard manual work as possible.

Although I cannot subscribe to the theory that all dusts are hazardous until proven harmless, I do know that working in dust is unpleasant, even if it is not injurious, and I was and am convinced that with just a little thought and comparatively a small expenditure of money, the amount of dust can be enormously reduced. The easiest way to reduce dust is to take dust samples of representative operations

at fixed intervals of time, even if only once a month, place the results on a chart and send it to the main office of the company, as this procedure, which costs practically nothing, will result in some executive giving the matter of lessening the dust a little thought.

At our Balmat Division in New York State, we reduced the dust in stopping operations, for example, from 40,000,000 to less than 10,000,000 particles per cubic foot merely by insisting on wet drilling, including collaring the hole wet, wetting down before blasting and mucking and increasing the ventilation by the use of a fan. With the exception of the fan cost, the expense was negligible, and our Division Manager estimates that he would require at the present time eight or ten additional men per day in a total force of 185 to maintain the present production if a fan had not been installed.

In the sintering operation at our Josephtown, Pa., zinc smelter, a dust prevention and recovery plant was installed at a cost of approximately $26,000. Disregard for the moment the greatly improved working conditions and employee satisfaction, the minimum saving per year is over $5,000, and therefore the installation will pay for itself in less than six years. But the following example of making money is even more satisfactory—at the same Division some $13,000 was expended in improving working conditions in the furnace basement, and as the result it is estimated that the recovery in the furnaces has been improved by over one per cent. This saving seems very small, but it is one which will more than pay for the operating cost of the installation, refund the entire $13,000 investment in one year, and show a profit of about $13,000 each year thereafter.

I strongly urge that progessive companies currently obtain information as to dust, fumes, etc., under prevailing working conditions. It is even advisable to have this data prepared by a disinterested and recognized authority in the medical or engineering field of industrial health, because if the information is secured by the company's own employees, it is often disregarded by Compensation Committees or the Courts on the basis that it is prejudiced, just as is often the case when the data has been obtained by so-called "experts" after cases have been filed, and when it is necessary to prove that the conditions then found were the same as those prevailing before or at the time of alleged "accident."

The Air Hygiene Foundation is in an excellent position to undertake the "disinterested" examinations, and if harmful conditions are found, to advise what corrective steps should be taken. The Foundation can also render industry an extremely valuable service through acting as a central clearing house for collecting, evaluating and disseminating industrial health information, and in fact has already done so. It has also been "productive" in its research and sound and timely bulletins on medical, engineering and legal phases of the industrial disease problem.

Another way that the Foundation can be most constructive (provided it has built up a reputation for reliable research and honesty) is to aid the State legislatures in preparing workable compensation laws and codes. As many of you know, during the last few years, a number of States have set hygienic standards, which greatly vary, and some of which are so poorly defined, that they are of no great value, either to employer or employee. Codes must be based on actual proven conditions, clinical results and the mechanical ability of available equipment—not first on "impressions", hysteria, or because of political expediency.

In closing I earnestly hope that the present members will avail themselves of the valuable assistance that the Foundation can give, that they will be willing to make some contribution other than their dues for continuing and developing the research activities, and that they will try to obtain as new members other companies from their own industries, whether or not such companies are competitors in business. I use the word "business" because in industrial health there are no "competitors". All employees gain through improved work-conditions, and all employers benefit through lower operating costs.

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would at best leave us with a shadow and not the substance. It is going to take courage of a high order to resist the allurements that may be offered in the form of governmental regulations as a quick way to profits, to turn our backs on any and all forms of price fixing, but our goal is the preservation of the American way of life, of civil and religious liberty, and of economic freedom. What could be more worth while? May I remind you, as a final word, that "security" has been the fashionable objective in this decade of depression and decadence. This country was not built up by seekers of security, but by self-reliant adventurers, and we must recapture their gallant fighting spirit. If we do, nothing can stop the resurgence of that old singing, dynamic America we once knew.

The Impact of War on Construction[1]

By THOMAS S. HOLDEN

Vice President, F. W. Dodge Corporation, New York City.

• **What effect the European conflict will have upon the construction industry during 1940 is a question of vital concern to crushed stone producers. Mr. Holden's observations will be found to be of intense interest and real value in considering plans for the coming year.**

WHILE the impact of the European war upon our whole economy is being felt already and is likely to be felt in numerous other ways as the war continues, it has become increasingly evident since September 1 that the course of events in this country will vary in many important particulars from the pattern of 1914-1918. Therefore, while a dusting-off of twenty-five-year old charts and statistical record books has some value in giving a perspective view of the present situation, it does not give us a sure guide for the future. The future, if you please, is just where it always has been—ahead of us and not behind us.

This war itself is different from the other one. Observe the lineup of the nations; Russia, Italy, Turkey, and Japan are in radically different positions from 1914. The trenches on the Western Front are reinforced concrete instead of mud. Armies are mechanized and motorized. Up to the present moment, the strategy of the combatants has consisted of blockades and diplomatic maneuvers, instead of extensive engagements of land forces.

The attitude of the American people is radically changed this time. In 1812 and in 1917, we were drawn into general European wars to defend the freedom of the seas. Only two weeks ago, the Congress of the United States, with the approval of a majority of the American people, voluntarily abandoned the freedom of the seas as not worth fighting for. American business leaders have practically unanimously, and I believe with sincerity, disclaimed any desire for a war boom and have used every proper means at their disposal to curb inflationary prices and inflationary buying. In 1917, there was no widespread fear that the totalitarian mobilization of finance, industry, and man-power necessary for conduct of our war participation might lead to permanent changes in our political, economic, and social institutions. This nation is now determined to profit by its past experience, to view all factors realistically, and to consider their long-range implications; it is set to use every means in its power to prevent history from repeating itself in the United States.

Our economic system itself has not stood still since 1914; in fact, many changes have taken place. We have become a creditor nation, we have experienced the unprecedented boom of the 1920's and the great depression of the 1930's; marked changes have taken place in the rate of population growth and industrial expansion. Our banking system has been greatly modified, our Federal Reserve System, a struggling infant in 1914, has grown to adult stature; mortgage finance is being transformed from the pawnbroking system characteristic of the horse-and-buggy era into a modern long-term credit system. At the moment, we have surpluses of raw materials, industrial plant capacity, and man-power. In consequence of all these facts, we cannot follow the easy path of plotting curves parallel to those of the World War period in estimating the course of construction activity in the near and in the more distant future.

It begins to look as though the menace of rapidly rising commodity prices and construction costs has been, at least temporarily, averted. If so, this is a most encouraging omen for private construction in 1940. There is in the construction industry and among the producers and suppliers of materials a very vivid recollection of the price-deflation depressions of 1920-1921 and of 1937-1938 and strong conviction that this must not happen again. I believe we can count on relatively stable construction costs through most, if not all, of 1940, and have so counted in making up the F. W. Dodge Corporation's estimates for next year.

It looks very much as though general business and industrial activity, employment, and national income would average substantially higher in 1940 than in 1939. An upward movement was already in progress before the declaration of war. The Federal Reserve Board's adjusted industrial production index rose from 92 in April and May to 102 in August. In September, orders on inventory replenishment

[1] Presented before the Construction Industry Conference, November 16 and 17, 1939, Washington, D. C., held under the auspices of the Chamber of Commerce of the United States.

and, to some extent, for inventory accumulation, ran the index for the month up to 110, and it went still higher in October. Most observers agree that the recent acceleration of industrial activity cannot be maintained at the same rate, and they anticipate the possibility of a temporary set-back in the early months of next year. War orders for airplanes, motorized equipment and some other commodities are being placed in this country by England and France, and our own defense program will step up production in certain industries. But, so long as this war is being fought principally by blockades and diplomacy, the rate of destruction and replacement of materials will not be what it was in 1914. Against the factor of accelerated industrial production, we must also set the extreme dislocation of our foreign trade, a factor of great importance, although affecting construction only indirectly.

Increased activity next year in general industry and business is vitally important as a sustaining base for increased private construction. In the absence of population pressure of nineteenth century intensity, absence of any rapidly expanding industry comparable in scope with railroads or automobiles, and the absence of any great shortage of shelter, a mere desire for better shelter must be accompanied by generally augmented purchasing power, in order to be translated into an active and effective demand. Increased residential building is, at this moment, as dependent on increased industrial and business activity as industrial and commercial building. Fortunately, the indications seem favorable for increased activity in 1940 in all three of these important classes of private building operations.

It seems likely that increased private building volume will tend toward concentration in the busiest industrial centers, those which are likely to be more fully employed and more prosperous next year than centers largely dependent upon agricultural prosperity. No doubt, some busy industrial cities will develop housing shortages, as well as needs for plant expansion and new and modernized commercial space.

In estimating the extent of increased private building that may take place next year, it is necessary to give some weight to the possibility of a temporary business setback in the early months, the possibility of peace in Europe, and the fact that 1940 will be an election year. It sems to me that Americans have gained in recent weeks a very strong conviction that this country can stay neutral; if we continue to hold that conviction, we will necessarily devote a great deal of attention to domestic problems during the next session of Congress and during the election campaign. While there is reason to expect less social reform legislation and less business-baiting than we have been having, there will be some people who prefer to delay their building commitments until after election.

After weighing these possible deterrents against the favorable factors, the Dodge statistical staff appraises the probable 1940 increase in private building and engineering expenditures at 10 to 15 per cent over 1939. Our dollar estimates actually work out with an increase of 11½ per cent. This increase would include increased activity in commercial and industrial building, one and two-family houses, and privately owned utilities. The one important class of private construction for which we have estimated a decline consists of apartment houses. There has been a declining trend in this class of activity in recent months, and the prevailing wage amendment which the last Congress tacked on to Section 207 of the National Housing Act has lessened somewhat the value of Section 207 as a stimulant to rental housing. However, any decline in private apartment building that takes place is apt to be moderate and will certainly be much more than offset by multiple dwellings built under the U. S. H. A. public housing program, which will be discussed later. These estimates are conservative; they represent volumes of private building that might conceivably have been attained next year even if there were no war in Europe, although the potential impact of war has been considered in their making.

The war may, perhaps, affect publicly-financed building and engineering work in 1940 somewhat more than it is likely to affect private work. However, even in this field, there was evidence of change before the war declaration. The last session of Congress turned strongly against pump-priming as a policy, curtailed W. P. A. activities, and acted adversely upon the Administration's proposals for a new spending program. Consequently, while the W. P. A. still has some funds that it can use in a somewhat limited way for force-account construction, the P. W. A. has very nearly finished its last program and has practically no money to carry over into 1940. The advent of war makes it very likely that the bulk of the deficit spending which the next Congress will authorize will be for the defense program. As far as we have been able to learn, the defense program will include only a moderate volume of construction, including army airfields, port developments, base hos-

pital improvements, some army housing, and other buildings at army posts and naval bases. A very large proportion of defense construction will be done in the Canal Zone, Puerto Rico, the Virgin Islands, and Hawaii. Of the portion in continental United States, about a third will be on the West Coast. Congress will also probably be asked to authorize a moderate P. W. A. program to supplement the army and navy defense program. If authorized, this P. W. A. program is likely to consist principally of highways considered important for potential military uses, hospitals, some municipal airports, some power plants considered by the Administration as necessary for defense. It seems likely that a modified P. W. A. program of this character may be authorized by Congress.

To offset a very considerable reduction in P. W. A.-stimulated construction, two other Federal programs will carry over in a large way. The first of these is the Federal-aid highway program, which is carried out by the Bureau of Public Roads in partnership with the various states. There is a very large carry-over balance in this fund, which the states can draw upon if they are ready to match the Federal money on the customary 50-50 basis.

The other carry-over program is the public housing program of the United States Housing Authority. Although the last Congress refused to increase authorizations for public housing, only about 36 per cent of the original program will have reached the construction contract stage by the end of 1939. Consequently, regardless of whether the next Congress authorizes any extension of the public housing program, a very large increase in public housing contracts under the present program may be expected. Such increased authorization as Congress may give will be more likely to affect 1941 construction volume than next year's activity.

The net result of these shifts in emphasis in the field of public building and engineering work we estimate as producing a 1940 volume of publicly-financed construction, about equal to the 1939 volume. This year's volume will have been 11 per cent less than that of 1938. Consequently, the estimated gains in next year's private construction do not seem to us likely to be cut down by appreciable declines in public construction.

A summary of the F. W. Dodge Corporation's 1940 estimates by classes, can be given here, the figures being based on dollar volumes of contracts in the 37 Eastern states:

Commercial building: an increase of 16 per cent over 1938.

Manufacturing buildings: an increase of 41 per cent.

All other non-residential buildings (principally public and institutional buildings): a decline of 15 per cent; hospitals are expected to increase, religious buildings to be built in the same volume as in 1939, and the other classes to decline.

Residential building: a 5 per cent increase in private residential building and a 65 per cent increase in public residential building, netting a 14 per cent increase in all residential building. Large-type residential buildings (apartments and hotels, including both privately and publicly financed) are estimated to increase about 26 per cent; one- and two-family houses are estimated to increase about 9 per cent. New family dwelling units would increase in about the proportion of total dollar residential volume, 14 per cent.

Heavy engineering construction (public works and utilities): the total volume is estimated at practically the same as 1939, the net result of moderately increased highway construction, sizably increased electric utility construction, and declines in all other classes.

The net result of an estimated 11½ per cent increase in total private construction and a 1 per cent increase in public construction would be a 7 per cent increase in total construction volume over 1939. As usual, the Dodge Corporation makes these estimates, not in the capacity of an oracle with prophetic powers, but as a reasoned set of guesses which we hope will be useful for executives who are responsible for advance planning for their organizations. Increased airplane production and army and navy construction are apt to help the 1940 volume of activity in the Pacific Coast states very considerably; with the possibility of larger construction increases in the far west than in the eastern area.

It is obvious that these estimates are not based on expectations of a war boom or a war inflation in 1940, although consideration has been given to the war stimulus to certain industries and to our own defense program. An early peace might be somewhat upsetting. Continuation of the war in Europe through next year and beyond would tend to acceleration of war orders, generally expected to come rather slowly in the near future. Any marked speeding up of the war and of war purchase might

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Causes of Highway Balances[1]

FUNDAMENTAL obstacles to the progress of the highway program which are delaying prompt expenditures for the construction of federal aid highways have been cited by the state highway departments to THE CONSTRUCTOR. In an endeavor to determine what causes were behind the balances of federal aid funds which have not been put under contract, THE CONSTRUCTOR addressed the departments following publication of the article "Highway Program Threatened," in its September issue. They were asked the reasons for the delays in utilizing these funds for the construction of needed highways. The replies received indicate that the chief reasons for the delay are three in number:

Failure of the state governments to make adequate provision for state funds to match the federal allocations.

Insufficient time between making of allocations and start of year in which funds are to be expended to permit completion in advance of plans for year's program.

Right-of-way difficulties.

State Finances

The gas tax diversion menace, against which all those concerned with the highway program have been sounding a warning for many years, has in many states actually brought about the insufficiency of state funds which diversion opponents had anticipated. Directly connected with this is the action of legislatures in failing to appropriate enough highway money to match the federal aid allocations, since these legislatures, by their action in diverting the gas tax, announced their indifference to the needs of their states' highway systems. Typical statements from various highway department heads:

"The reason that our state has been unable to take up the balances available on federal aid has been the lack of funds to match these balances."

* * *

"Our balance of unmatched federal-aid and secondary funds resulted from the unwillingness of county officials to furnish funds required to match federal aid secondary funds available for work off the trunk highway system, and because of a large amount of expenditures during 1938 with maintenance forces."

"The greater part of the balance of federal funds still available for new contracts is due to the fact that the legislature has so far made no appropriation to match the 1940 federal funds or to provide funds for property damages in case of the 100 per cent grade crossing funds. Since the legislature does not meet again in regular session until the spring of 1941, no substantial reduction in this figure will be made for some time."

* * *

"The reason our state was lagging in placing federal funds under contract was due to the fact that we were short of state money to match the federal funds. It became necessary that we issue and sell some debenture bonds. This, of course, took time and we naturally were somewhat late in obligating our federal funds."

* * *

"We anticipate a considerable balance of unmatched federal funds at the end of the current biennium, June 30, 1941. This is due to the fact that the last session of the legislature reduced the gasoline tax revenue for highway purposes. . . . It is a fact that the present rate of financing is not sufficient to take care of the demand for more improved highways or the necessary reconstruction and further improvement of existing highways."

* * *

"There is only one difficulty in our state which delays the placing of federal funds under contract and that is the problem of matching such funds with state funds. We do not believe that it is possible to increase the taxation in this state to provide additional funds for road purposes, and it is therefore evident that the balances of the various federal aid funds, which must be matched, will probably gradually increase."

The financing of the federal aid highway program, it is pointed out by some highway officials, is not actually on a 50-50 basis, since the funds provided by the federal government must be used for construction only, with the state matching those funds dollar for dollar. However, the state must pay out of its own funds for administration, surveys, preparation of plans and specifications, buying right-of-way, etc.

This point advanced by the departments bears out the argument of the Associated General Contractors

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of America, which, in a resolution adopted by the fall meeting of its Governing and Advisory Boards, advocated that the federal government participate in the construction of the interregional highway system on a more liberal basis than the present 50-50 arrangement. It was pointed out that the costs connected with securing of land in this highway program would be so high that the states would not be able, under present financing conditions, to make any great headway in developing these interregional highways.

Planning Period

Replies from nearly all the highway departments point to the hampering effect which the time element has on advance planning of work. Typical statements made in the replies are:

"The apportionments of federal funds for the fiscal year could not be obligated until after our state budget had been approved."

* * *

"For the fiscal year of 1940, funds for which were available for expenditure, July 1, we have unobligated . . . 70 per cent (on September 30, 1939). . . . The last session of the legislature cut our administrative and supervisory service budget by 30 per cent, which has placed our design department, as well as our field forces, in a bad condition. We are at the present time behind in the design of both roads and bridges in the 1940 fiscal program. . . ."

* * *

"These federal funds are allocated for a certain period of time, which begins at a certain time and will go for a period of two years. . . . It is only fair that it be realized that the states must be given time

What ARE "Unobligated Balances"?

AS SO often happens in any argument, friendly or otherwise, considerable misunderstanding has arisen, in connection with our article "Highway Program Threatened," because of differing interpretations of the term "unobligated." As we explained in that article, we meant the balances which were "unexpended," that is, funds which had not been set aside for the purpose of paying for highways which were under construction or for which bids for construction had been asked.

Now, since there was once before, and there appears to be every indication of its happening again, a threat to the whole federal program because the states had great amounts of money standing to their credit which they were not spending, it is necessary that the situation be faced fairly. The situation at present is that each year's federal aid appropriations are available to the states for a two-year period, because the states are allowed one "year of grace" in which they may avail themselves of those sums. Thus, under the Federal Aid Highway Act of 1938, $135,000,000 of federal money was made available to the states at the beginning of the fiscal year 1940 (July 1, 1939) and they are permitted until July 1, 1941, to "obligate" those funds.

Now, scarcely a state has lost a cent of its federal aid due to failure to "obligate" its federal aid. But that does not mean that the states are using all the money, that is, letting contracts promptly for the construction of highways. Many of the states are utilizing the full period in which to take up their apportionments, thus delaying actual construction.

It is the existence of these large sums which helped cause the threat to the highway program in 1938 and resulted in the reduction of $65,000,000 in federal aid for the current year.

Let us not blink at the facts. These "unobligated" balances were caused by the very same factors which are discussed in this article as delaying the highway program. But it must not be supposed that those who have the worry of the federal deficit will fail to see that there is available for expenditure by the states large amounts which ought to be used, and certainly, it is difficult to explain why they do not have reasonable grounds for refusing to freeze more federal money in these same "unobligated" accounts.

to fit these funds in with the projects which the state highway departments believe should be undertaken. . . . It has been our experience that the programming and carrying out of the grade crossing elimination projects require considerable time: First, the railroads must be consulted and we must come to some agreement with them as to projects which are to be undertaken; the money is allocated on the basis of track milage . . . then we have to try to fit the projects to the money which can be set aside for each railroad. . . ."

* * *

"Following adjournment of the state legislature, certain adjustments were necessary in our financial set-up and these adjustments were reflected in a slowing down of contract awards towards close of the fiscal year."

* * *

"We expect to reduce the balance of federal aid highway funds to less than half of the amount shown as of June 30, 1939, before the end of the present calendar year. This will require plans, specifications and estimates for programmed projects to be submitted to Public Roads Administration for approval during the next three months. . . ."

* * *

"No contracts have been awarded covering projects in either the 1940 primary or secondary allotments."

* * *

"Federal funds, although available for obligation on January 1 of each year * * *. A considerable portion of time between the date of the allotment and the beginning of the fiscal year is consumed in securing approval of project statements and the several highway programs. . . . It might be argued that plans should be prepared sufficiently in advance so that the funds may be obligated immediately. That is all well and good but difficult of accomplishment in the past in view of the uncertainty of federal allotments as well as state revenue for highway purposes. . . . So far as this state is concerned, the solution is not in the reduction of the federal allotments but rather a more uniform program of federal allotments so that advance planning may be more effective so that more time will be available for ironing out the intricate details of major projects."

In connection with the solution of this time problem, D. A. McKinnon, state highway engineer of Montana, has made a careful analysis of the situation and has proposed a plan to solve it, which, with his permission, we print here:

"If it were possible that federal authorizations could be placed on, say, a five or ten year program, states like Montana and others which are short in their own funds (and there is no diversion of highway revenues in Montana) could establish a state financing plan which would assure adequate state money to match the federal funds. While the appropriations probably cannot be made for this long a period, is there any reason why the authorizations cannot be made or at least some legislation passed which would give the states enough assurance as to the extent of a proposed ten-year program in order that they could safely go ahead and set up their own financing plan? The authorizations of Congress do not exactly coincide with action which may be obtained from state legislatures and therefore the states find themselves in the condition that Montana has just rectified.

"If we could go before the people of Montana and assure them that there would be appropriated so much money for each ten years and show them the amount of money the state would have to raise to match the federal funds, I am sure that Montana would make the necessary arrangements. This plan would also eliminate the necessity of constantly enlarging and reducing engineering organizations due to the varying sizes and amounts of funds available through both state and federal sources each year.

"We talk of comprehensive highway plans and programs and we still do not know what funds will be available for anything but a two year period."

Mr. McKinnon's suggestion of a five or ten year program as a method of permitting planning of highway programs far enough in advance that all preliminary work could be taken care of and actual construction started at the beginning of the fiscal year bears out the argument advanced before Congress by the Associated General Contractors of America in 1937, when W. A. Klinger, then president of the association, appeared before the roads committees and urged a four-year highway authorization rather than the customary two-year period, pointing out the vast amount of advance planning, both financial and design, which must be done by the states before construction can be started.

"The overpowering legal obstacles and inhibitions that stand in the way of obtaining essential right-of-way," are cited as one of the most influential causes in the way of the proper development of the highway program by the Public Roads Administration in

its report, *Toll Roads and Free Roads,* submitted to Congress in the spring of 1939. Again and again, in the replies received by THE CONSTRUCTOR from the highway departments, the right-of-way problem is cited as a cause of delay in getting programs under way.

"About 25 per cent of the delay on federal aid projects has been caused by right-of-way difficulties," a letter reads. "Especially is this true since the Public Roads Administration requires that we must have the rights-of-way before approval is given to the project, or before advertisement can be had."

* * *

"State law will not permit the highway commission to expend funds for rights-of-way on secondary road projects, making it necessary for the counties to obtain rights-of-way. Many of the counties have insufficient funds and it is a hard grind to get these rights-of-way furnished."

* * *

"While there are many other factors involved in a grade separation program, yet, unquestionably, the right-of-way problem is the biggest stumbling block."

Highway contractors are, of course, in favor of the PRA requirement that right-of-way must be secured before contracts can be let, since they have suffered much in the past by having their jobs held up for weeks and months because of difficulty in securing rights-of-way.

Prompt solution of the right-of-way problem has been endorsed by the Associated General Contractors of America as one of the principal needs of the highway program today, and at its fall board meeting adopted a resolution which advocated the enactment of legislation enabling the acquisition by the federal government of adequate rights-of-way, thereby assisting states and cities in getting construction programs under way quickly. Companion bills to accomplish this purpose have been introduced in the two houses of Congress by Senator Hayden and Representative Cartwright, and the A. G. C. has given its endorsement to these bills and will urge their prompt enactment before the next regular session of Congress in January.

Impact of War on Construction

(*Continued from page 25*)

change the picture we have sketched. The estimates assume that the United States will stay out of the war through 1940 and will continue steadfast in its determination to stay out. It seems to me that our determination to stay out has been reinforced in recent weeks by a strengthened conviction that we can stay out.

It is scarcely necessary to speculate on what may happen to construction activity if this country should declare war. However, there is still a strong recollection of the curtailment of private building activity that took place twenty-five years ago. The two factors responsible for that curtailment were the rapid rise in building costs and the Government ruling that building projects to cost over $25,000 were non-essential unless needed for the conduct of the war.

For the present, the menace of rapidly rising construction costs seems to be allayed, and the possibility of war-time regimentation of the construction industry seems remote. There are no emergency powers now existing that would make this possible, and new emergency powers would require authorization of Congress. If a layman's observation on war probabilities is worth anything, it might be noted that, in the event of a declaration by the United States, there seems to be a more than even chance that we would not send a land army across the Atlantic, and would, quite possibly, make our contribution in airplanes, tanks, motorized equipment, munitions, foodstuffs, and credit. Full regimentation of industry like we had the last time might not be at all necessary, and efforts would probably be made for minimum disruption of civilian activities. It may be of interest to recall that, towards the end of the World War, severe housing shortages developed in a number of key industrial centers. A housing program had to be devised by the Government, which set up the United States Housing Corporation for that purpose. The Corporation was just beginning to complete some of its projects at the time of the Armistice. This time, we have at our disposal tested machinery for augmented private and public housing projects just as soon as the need appears. In this and in many other particulars, we are more ready by far than we were in 1917 to adjust our Governmental programs and our business procedures to new contingencies with minimum dislocation. Of course, new events may call for radical adjustments on fairly short notice, including as a possible necessity, some very considerable revision of 1940 construction estimates that may seem sound and reasonable today.

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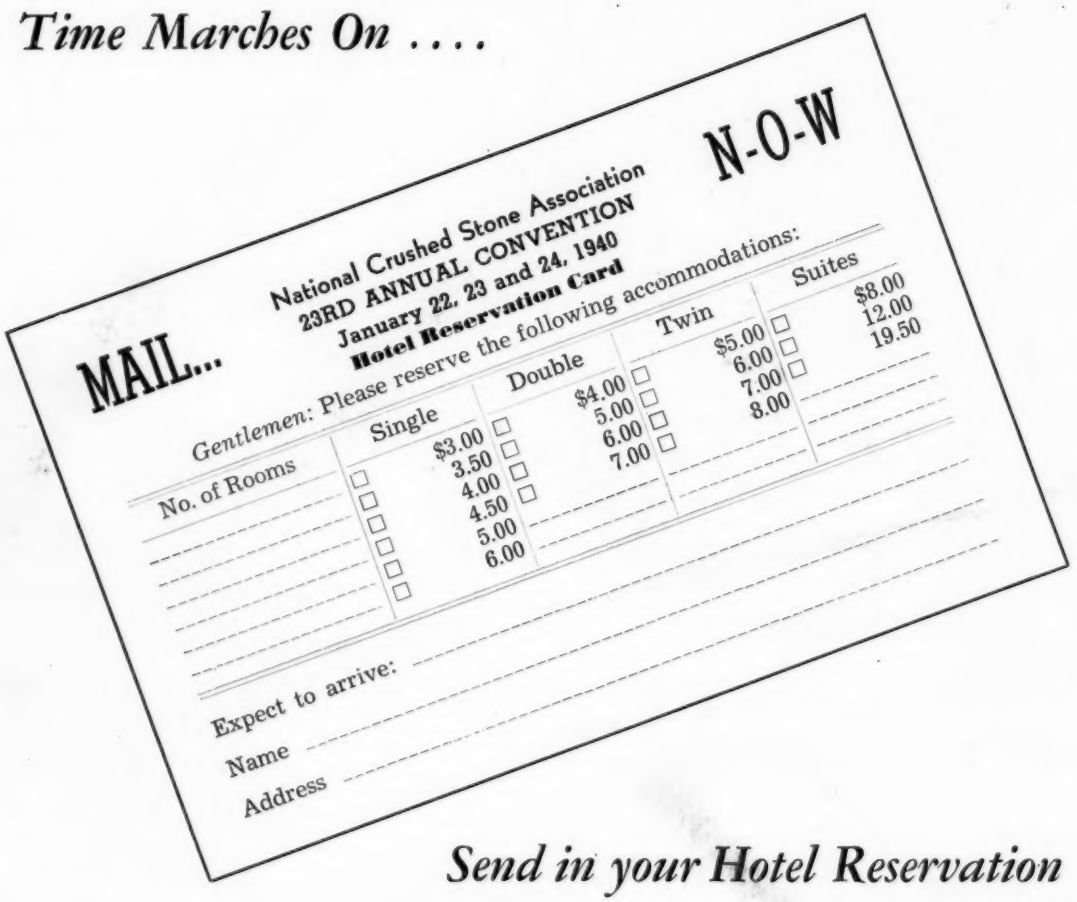

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